A Summary and Perspective of Recent IRIS Assessments and Impact on Planning Environmental Investigations

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Role of Risk Assessment on Environmental Projects

- Used to determine whether site requires further study or remediation
- Used with regulatory values to determine cleanup levels
- Risk-based screening levels (aka PRGs, RBCs, RSLs)
  - ►Screen sites early in project lifecycle
  - ► Determine project quantitation limits

Risk-Based Values Function of Toxicity and Exposure

$$\text{Risk} = \frac{\text{Intake}}{\text{Toxicity}}$$

↑Toxicity = ↓Criteria

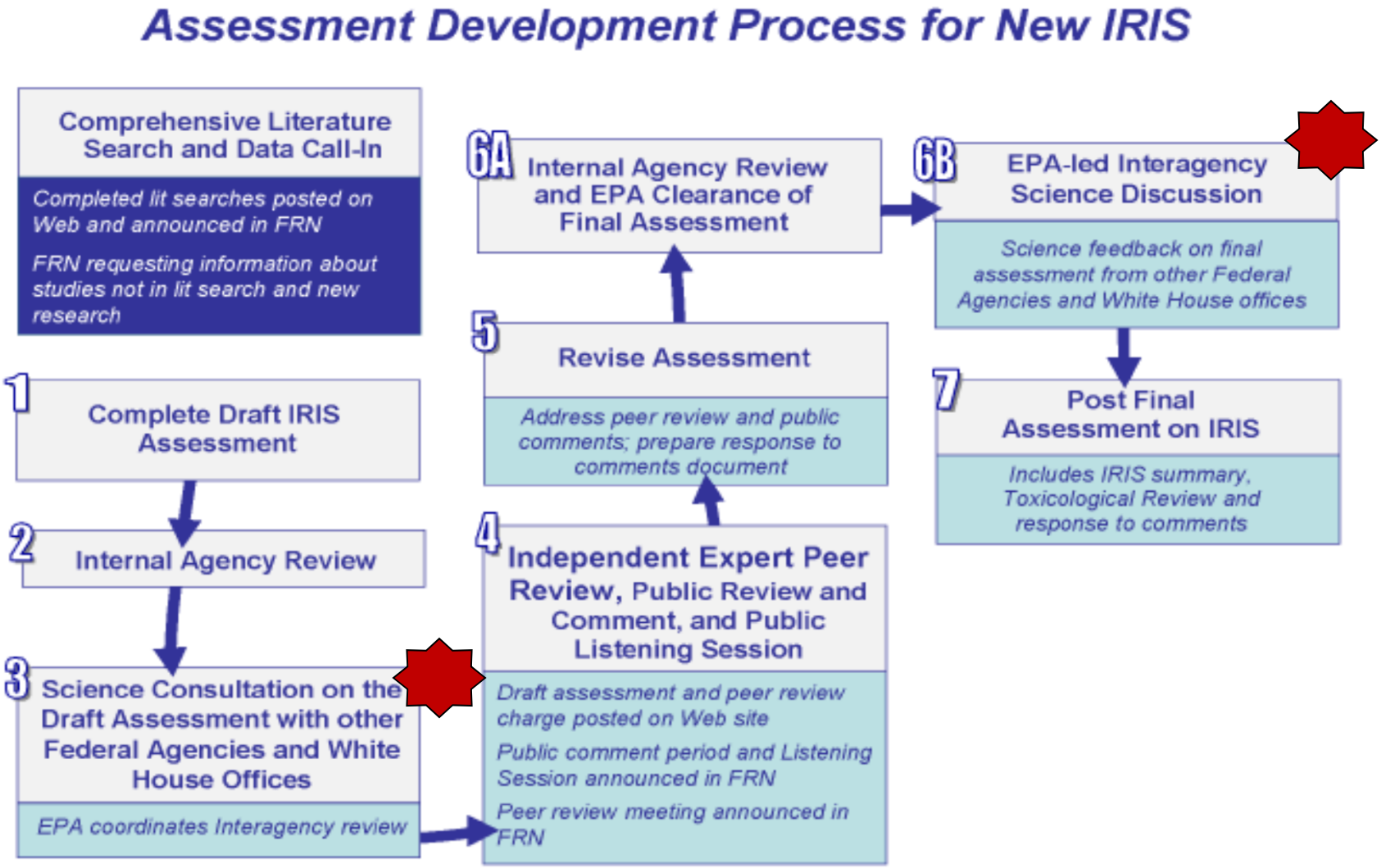
- Tiered approach used to identify toxicity values for site risk assessments
- Integrated Risk Information System (IRIS)
- IRIS values also inform regulatory decisions (MCLs etc.)

Emerging Contaminants (ECs)

- Are chemicals or materials of interest that are characterized by:
  - a perceived or real threat to human health or environment, and
  - there is no currently published health standard or there is an existing health standard, but the standard is evolving or being re-evaluated.

Source: "Initiation of Emerging Contaminants Characterization and Response Actions for Protection of Human Health" Issue Paper (ECOS &DoD Sustainability Workgroup, 2008)

DoD Participation in IRIS Interagency Reviews



Tetrachloroethylene
Status: External Peer Review

- 1998 initiated
- June 2008 external review version released
- Nat'l Academy Review Feb 2006
- Current external (SAB) and public review

Risk-Based Screening Levels*			
	Res. Soil (mg/kg)	Res. Water Use (µg/L)	Indoor Air (µg/m^3)
Current	0.55	0.11	0.41
New (draft)	0.293	0.179	0.122
Sources of current toxicity values include EPA IRIS, ATSDR and CalEPA. Lowest RSL target risk = 10^{-6} . Draft values not suitable for project use.			

*Using EPA Regional Screening Level Calculator

Trichloroethylene
Status: External Peer Review

- IRIS values withdrawn late 1980s
- 2001 draft released
- 2006 NAS review
- 2009 re-released
- Lowest RSLs based on 10^{-6} cancer risk

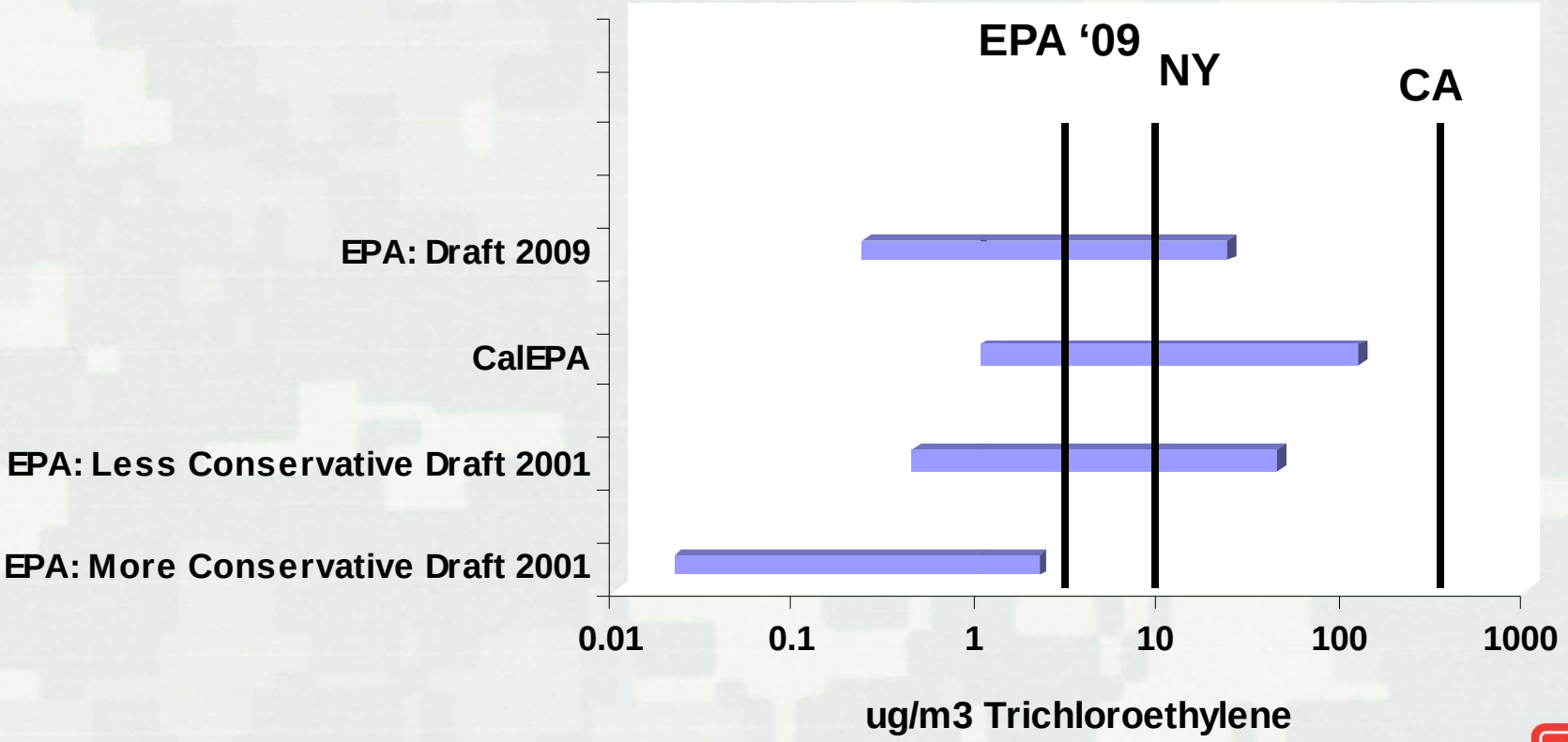
Do not utilize levels derived from draft toxicity values.

Risk-Based Screening Levels*			
	Res. Soil (mg/kg)	Res. Water Use (µg/L)	Indoor Air (µg/m^3)
Current	2.8	2	1.2
New (draft)	0.48	0.23	0.24
CalEPA source of current values. Lowest RSL target risk = 10^{-6}. Draft values not suitable for project use.			

*Using EPA Regional Screening Level Calculator

Risk-Based TCE Residential Indoor Air Concentrations

1E-04 to 1E-06 cancer risk and Noncancer



Dioxin
Status: External Peer Review

- Assessment initiated in 1990
- Released for public and peer review 2010
- Using cancer toxicity values in this draft residential screening levels could be as low as 0.45 ppt dioxin toxicity equivalent (TEQ, for dioxin-like compounds)
- Current EPA policy recommends 1000 ppt
  - ► Interim PRG may be released

Final IRIS Reference Dose for Cis-1,2-Dichloroethylene (September 2010)

- Oral noncancer reference dose (RfD) = 0.002 mg/kg-day; increased kidney weight
  - ► PPRTV used until this time
  - ► MCL = 70 µg/L
- No cancer toxicity values published

Risk-Based Screening Levels*		
	Residential Soil (mg/kg)	Residential Water Use (µg/L)
Old	780	370
New	156	73
Fold Change	5x	

*Using EPA Regional Screening Level Calculator

Final IRIS Reference Dose for Trans-1,2- Dichloroethylene (September 2010)

- Oral noncancer reference dose (RfD) = 0.02 mg/kg-day;
- Based on decreased antibody production by the spleen
- No change in RfD value, but change of critical effect
- MCL = 100 µg/L
- No cancer toxicity values published

Final IRIS Values for 1,4- Dioxane (August 2010)

- Oral noncancer reference dose (RfD) = 0.03 mg/kg-day; Liver & kidney effects
  - ► Inhalation RfC will be developed in separate document
- Oral cancer slope factor (SF) = 0.1 mg/kg-day $^{-1}$; Rodent liver tumors

Risk-Based Screening Levels*		
	Residential Soil (mg/kg)	Residential Water Use (µg/L)
Old	44.1	6.1
New	4.85	0.67
Fold Change	9x	

*Using EPA Regional Screening Level Calculator

Final IRIS Values for Hydrogen Cyanide and Cyanide Salts (September 2010)

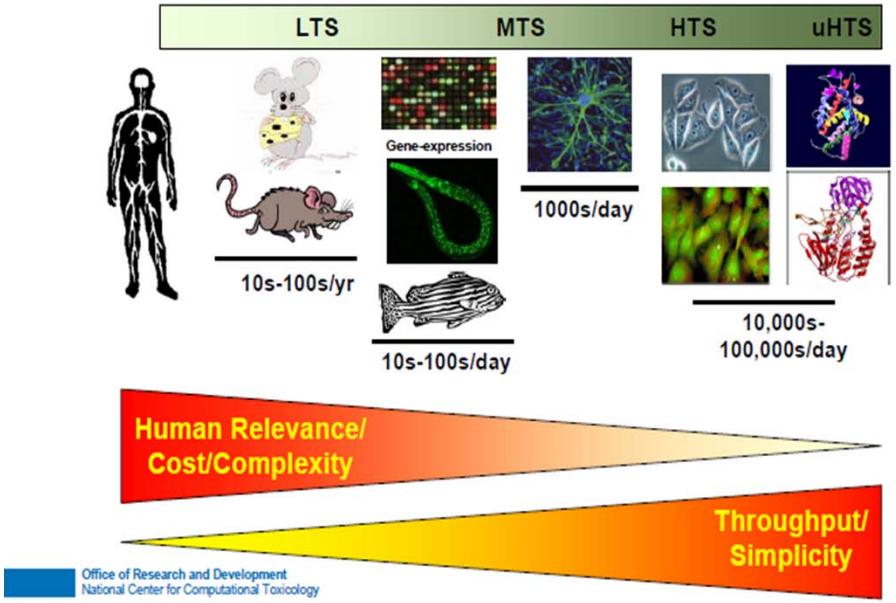
- New Oral noncancer RfD = 0.0006 mg/kg-day; male reproduction effects
- New inhalation RfC = 0.0008 mg/m^3; effects on nervous system and thyroid
- RfD is 33 times more conservative than previous IRIS value
- RfC is 3.75 times more conservative than previous IRIS value

Basis for Changes

- New study data
  - Sensitive measurements
- Science policy
  - Mutagenic mode action adjustment
  - Uncertainty factor application

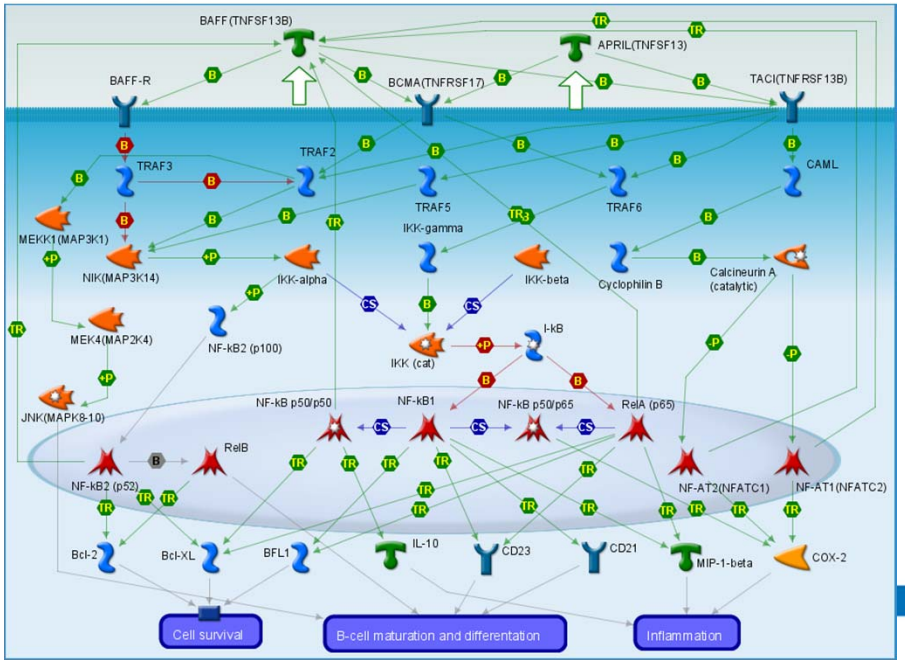
High-Throughput Screening Assays

batch testing of chemicals for pharmacological/toxicological endpoints using automated liquid handling, detectors, and data acquisition



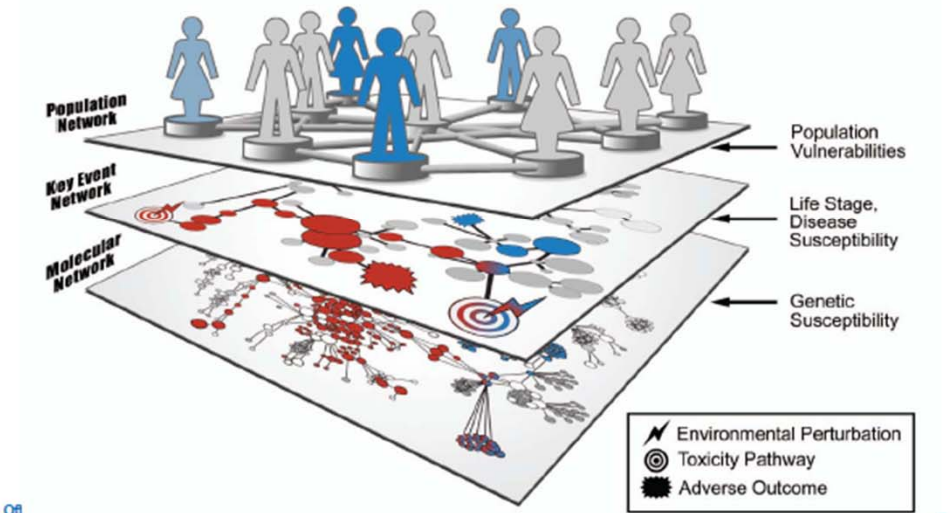
Office of Research and Development
National Center for Computational Toxicology

The future!
EPA Next Generation Risk Assessment
New technology will lead to greater capacity and speed.
Interpretation of results is a challenge; studies underway to link known effects with screening assay data.



Systems Exposure Science : Extending Network Analysis

Consider coupled networks spanning multiple levels of biological organization



Adapted from Edwards & Preston (2008), Tox Sci, 106(2):312-318